Multiple Wavelength Quantum Dot Lasers (MW-QDL)

Completed Technology Project (2014 - 2015)

Project Introduction

An innovative method to achieve optical gain over a wide spectral range using new laser materials is being investigated. Multiple wavelength quantum dot lasers (MW-QDL) will be designed to generate emission and gain over a range of wavelengths from the UV-vis to MIR spectral regions. New quantum dot laser materials will be characterized and the best candidate materials will be chosen for MW-QDL.

A new method for generating tunable wavelengths employing quantum dot lasers is being investigated. Quantum dots will be engineered to produce emission and laser gain over a range of wavelengths from the UV-vis to mid-infrared spectral regions. Atmospheric species such as O_3, CO_2, NO_2, and CH_4 will be targeted for predication of the consequences of atmospheric sciences. These molecules have numerous strong optical resonances in the mid-infrared. However, according to the Decadal Survey, mid-infrared lasers needed for future missions do not exist. This project addresses a need for a compact, tunable laser source.

Anticipated Benefits

MW-QDL is a new exploration pathway into novel compact, multiplex quantum dot-based laser sources. The investigation is focused on visionary aeronautics and space exploration. This is a potentially enabling technology for missions seeking compact, multiple wavelength quantum-dot based laser sources.

The Decadal Survey recommends missions, such as GACM, to measure atmospheric constituents, but has stated that there is presently no suitable laser for GACM. An anticipated benefit of this project is to invent the specialized lasers that may be useful for future missions.

MW-QDL will cover a wide operating range (UV-vis to MIR). This technology could enable compact, light weight, multiplex lasing capability for commercial space exploration.

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Center Innovation Fund: LaRC CIF

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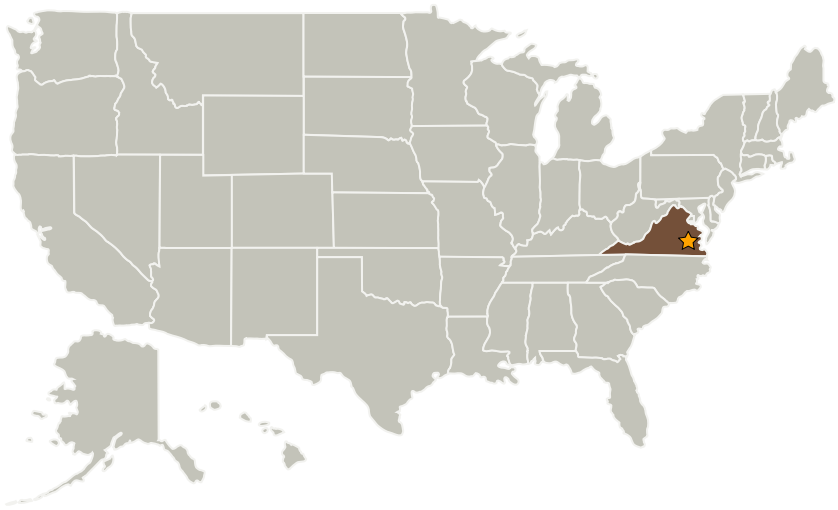
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations
Virginia

Project Management

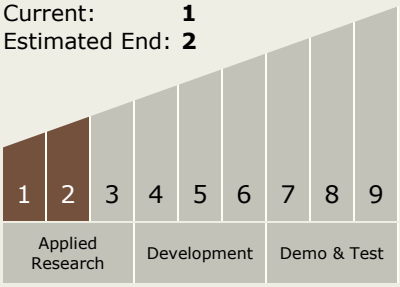
Program Director:
Michael R Lapointe

Program Manager:
Julie A Williams-byrd

Principal Investigator:
Devin Pugh-thomas

Technology Maturity (TRL)

Start: **1**
Current: **1**
Estimated End: **2**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers